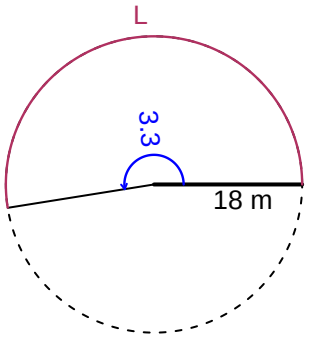
Name: Date:

Trig Final (SLTN v650)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.3 radians. The radius is 18 meters. How long is the arc in meters?

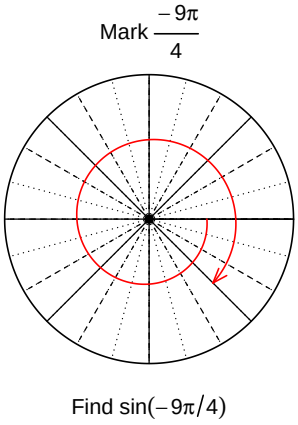


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

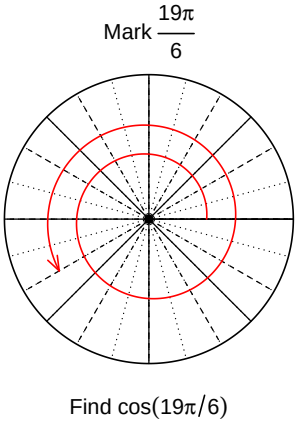
$L = 59.4$ meters.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-9\pi}{4}\right)$ and $\cos\left(\frac{19\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(-9\pi/4)$



Find $\cos(19\pi/6)$

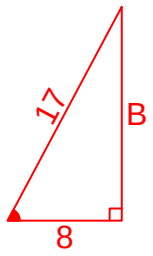
$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(19\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-8}{17}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

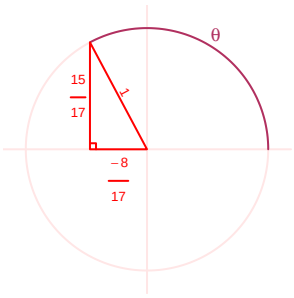
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$8^2 + B^2 = 17^2$$
$$B = \sqrt{17^2 - 8^2}$$
$$B = 15$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{15}{17}}{\frac{-8}{17}} = \frac{-15}{8}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.06 Hz, a midline at $y = -7.47$ meters, and an amplitude of 4.24 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.24\sin(2\pi 6.06t) - 7.47$$

or

$$y = -4.24\sin(12.12\pi t) - 7.47$$

or

$$y = -4.24\sin(38.08t) - 7.47$$